# RFID Frequently Asked Questions

**What is RFID?**
**Answer:** RFID (radio frequency identification) is a fast, automatic identification technology similar in application to bar code technology but uses radio frequency (RF) instead of a visual scanner to transfer data between a reader and an item being tracked. Since high performance systems can read data on tags at a speed of at least 40 tags per second, RFID can be data collection at warp speed without human interaction; a highly efficient wireless alternative for item management tracking.

**Will RFID replace bar codes?**
**Answer:** It is likely that RFID and bar codes will coexist for many years. Bar codes are inexpensive and effective for certain tasks.

**How does RFID work?**
**Answer:** RFID uses a reader to locate and track special tags or labels attached to an item, similar to a bar code system. Instead of collecting laser light reflections off printed bar code labels, RFID uses low wattage radio frequencies to read from and write to the tags.

The RFID tags, or labels, equipped with an RF antenna and a tiny computer chip, broadcast information to the RFID reader. These broadcast radio waves do not require a direct line of sight or one-at-a-time labor intensive involvement. Tags do not have to be in contact with the device that "reads" the information stored on the chip.

**What is a tag?**
**Answer:** In general, an RFID tag consists of an application-specific integrated circuit (ASIC) and an antenna that can be mounted on various substrates. Each element of an RFID tag is selected for optimum efficiency for the application. Physical sizes can range from as small as a thumbnail to as large as a brick. Intermec's RFID tag and label product line offers up to 2048 bits of memory and read ranges up to 25 feet, dependent upon the application. The term "tag" and "transponder" are synonymous.

**How much do RFID tags cost?**
**Answer:** Tags can cost as little as 10 cents or as much as $100 depending on the type of tag, the application and the volume of the order. Generally speaking, finished smart labels that can be applied to cases and pallets typically cost between 10 and 20 cents, depending upon volume. Active tags - those with a battery - can cost far more.

**What are the benefits of RFID compared to other automatic identification technologies such as bar codes?**
**Answer:** RFID-enabled systems help companies cut costs, improve customer service, reduce labor, increase accuracy, and improve production throughput. The technology is superior compared to the limitations of traditional ADC technologies. Bar code and vision systems rely on optics and require a relatively clean and moisture. free environment. Touch memory does not use optics but does require a relatively clean environment because contact must be made to read the tag.

**Why is RFID better than using bar codes?**
**Answer:** RFID is ideal for dirty, oily, wet or harsh environments. RFID tags and readers have no moving parts so require no maintenance. RFID tags can be read and write, intelligent, and carry larger amounts of data compared to other identification systems. Unlike bar codes, RFID tags are virtually impossible to copy or counterfeit. RFID is fast. The tag can be read and communicate back in milliseconds. RFID systems can also read multiple tags at once, much faster than bar code.

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**How does RFID enhance the supply chain?**
**Answer:** It allows updated information to travel with the individual item as it passes through the supply chain . information that can be dynamically changed throughout the journey.

**If I use RFID in my processes, and the product is shipped to a customer containing some data I don't want shared, is there anything to prevent access to that data?**
**Answer:** Yes, permanent memory locks within the computer chip can secure data at the byte level to prevent access of data to unauthorized users. Bytes left unlocked, can be re-written to 100,000 times. Bytes can be locked in the factory or in the field to protect data as it is entered along the supply chain. Data can also be encrypted or password protected if the application requires data security.

**How is RFID being used today?**
**Answer:** Existing uses of RFID include: Raw material tracking, work-in-process (WIP) tracking, pallets/box tracking, a cradle-to-grave supply chain application in a retail environment, parcel package tracking, a border control checkpoint application and many more. Most of the companies adopting this technology are early adopters and view this as a competitive advantage in their specific industry. Consequently, they have been hesitant to publicize their efforts. Intermec appreciates their recognition of the competitive advantage of this technology and is respectful of their decision to delay publicizing their efforts.

**How easily can I implement an RFID solution with my business or one of my customers?**
**Answer:** Products are available that can be fully integrated, support multiple frequencies, complement legacy systems already in use, and provide interconnectivity with other automatic data collection products. Intermec's RFIDeploy Services help customers by evaluating RFID technology and integrating it seamlessly into their business processes. RFIDeploy is a suite of consultative and site engineering services that combine together to accomplish a fully integrated RFID system implementation.

**What kinds of problems might one encounter in operating RFID systems?**
**Answer:** Several potential issues must be addressed successfully at the front end of the design process. Careful selection of a dynamic solution is paramount. In every case, a system design approach is required before implementing an RFID solution. The requirements for multiple tags, speed of operation, accuracy, cost and security must all be considered to provide the result demanded by the application. A site survey is a critical step in the evaluation of RFID solutions. Some of the common problems with generic RFID are:

- Like other technologies using radio waves (garage door openers, remote control toys, pagers, etc.), RFID systems are subject to interference from unwanted signals· electromagnetic noise. To protect against "misreads", tag data contains bits that are encoded to provide error detection by the reader to improve the reliability of the system.
- In lower performance systems, when two tags are in the field of the reader at the same time, "collisions" can also occur where both tags try to transmit to the reader at the same time. A common method used to avoid collisions is to design the tags to select random delay time before responding. Intermec RFIḌs arbitration algorithms make it virtually impossible to encounter a noticeable collision or slow down in multiple tag discrimination.
- The presence of metal can block the performance of RFID readers and tags as well, which affects read range. However, metal can also enhance or amplify the read range of RFID with good system design.
- The presence of water can also impede the performance of RFID, but as with electricity and water, good system design can overcome most limitations.

**Does Intermec RFID follow any standards?**
**Answer:** Absolutely. In fact, in October of 1999, Intermec was the first company to announce that its RFID product family met the new item management standard adopted by the American National Standards Institute (ANS NCITS 256-1999). In keeping with our RFID leadership, Intermec was the first to announce and demonstrate that its RFID product family met the EPCglobal Gen 2 air interface standard.
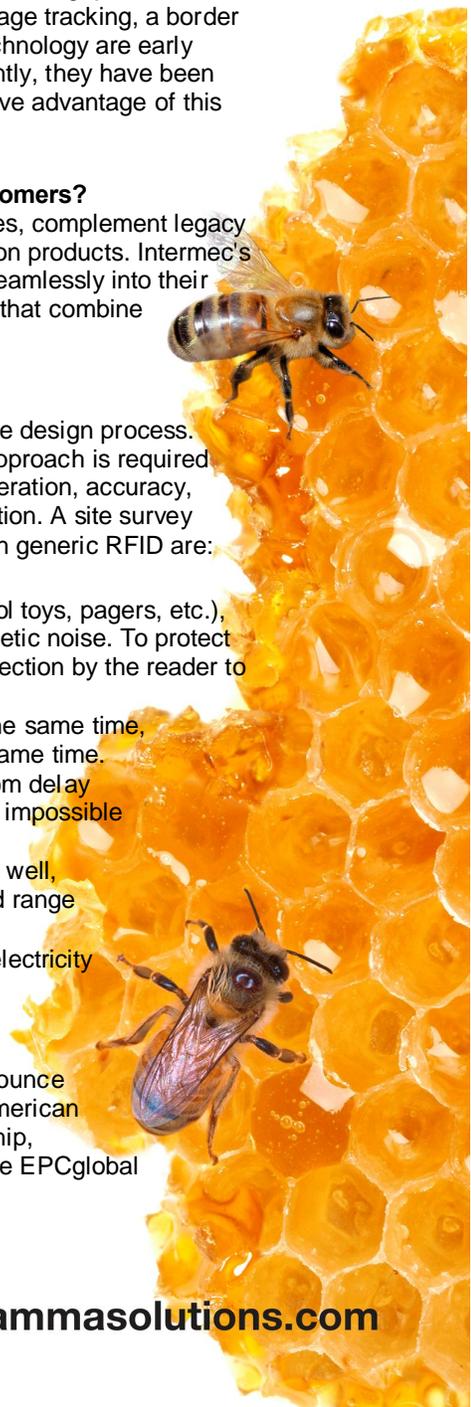
Today, Intermec is the only RFID company whose RFID readers and tags are EPCglobal certified Gen 2 compatible and interoperable. Intermec RFID supports all relevant adopted and emerging national and international standards including:

- EPC UHF Generation 2 - Air interface protocol specification for item management.
- ISO/IEC 18000 Part 6 - Air interface for item management at UHF.
- ISO/IEC 15961 & 15962 - Information interface for object oriented use of RFID in item management.
- ANSI INCITS 256:2001 - American RFID standard for item management.
- EAN.UCC GTAGï  - Application standard for use of RFID in the macro supply chain.
- ANSI MH 10.8.4 - Application standard for RFID on reusable containers.
- ISO/IEC 18000 Part 4, Mode 1 (2450 MHz)
- ISO 18185 Electronic Seal Tags
- ISO 22389 RFID Read/Write for Containers
- Automotive Industry Action Group (AIAG) B-11 Tire and Wheel Identification
- All Intermec RFID Readers are Cisco Compatible (CCX)

**What are Intermec's target markets?**
**Answer:** Item, case, pallet and container tracking for supply chain management for the Logistics, Retail, Consumer Goods, and Industrial manufacturing industries.

**What are the key differentiators of Intermec's RFID products to others in the marketplace?**
**Answer:** The most obvious advantage is that Intermec is the only company to bring all the vital elements of automatic data collection, including RFID, together under one company - ensuring compatibility and inter-operability of systems. Intermec RFID products are certified EPCglobal compatible and interoperable. The Intermec IF5 Fixed RFID Reader was ranked #1 in adjacent dock door use by leading U.S. RFID testing lab ODIN technologies. Intermec RFID's technology differentiators include: high data rates and capacity, low cost, read/write capability, foolproof anti-collision protocol (no jamming), lockable memory at the byte level, bulk and sub-group programming (write to one, many, or all simultaneously), and frequency flexibility of the chip so tags can move throughout the world operating at the reader frequency approved in each country. With a large, multiple-field read/write memory, each of Intermec's tags and inserts can simultaneously support EPC, GTIN, UPC content, and Advanced Shipping Notice reference codes, as well as original manufacturer and distributor unique codes, delivering the user the ultimate flexibility to adapt as current and future standards evolve.

**What is the difference between active and passive tags?**
**Answer:** Active RFID tags have a battery, which is used to run the microchip's circuitry and to broadcast a signal to a reader (the way a cell phone transmits signals to a base station). Passive tags have no battery. Instead, they draw power from the reader, which sends out electromagnetic waves that induce a current in the tag's antenna. Semi-passive tags use a battery to run the chip's circuitry, but communicate by drawing power from the reader. Active and semi-passive tags are useful for tracking high-value goods that need to be scanned over long ranges, such as railway cars on a track, but they can cost anywhere from a dollar to over $100 each, making them too expensive to put on low-cost items.

**What are the different frequencies?**
**Answer:** RFID systems use many different frequencies, but generally the most common are low- (around 125 KHz), high- (13.56 MHz) and ultra-high frequency, or UHF (850-928 MHz). Microwave (2.45 GHz) is also used in some applications. Radio waves behave differently at different frequency, so choice of frequency should be based on the demands of the application.

**Courtesy of Intermec Technologies Corporation 2007**

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